

C-A OPERATIONS PROCEDURES MANUAL

12.15.a Setting Tandem Facility Radiation Zones - CHECKLIST

C-A-OPM Procedures in which this Attachment is used.		
12.15		

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12.15.a Setting Tandem Facility Radiation Zones - Checklist

(Team Leader)_____ (Operator 2)_____

Time:_____ Date:_____

Prerequisites

- Two Operators to perform the sweep
- C-A-OPM-ATT 12.15.a – Setting Tandem Facility Radiation Zones Sweep – Checklist
- If TtB will operate, then the MP-7 HE Zone shall be disabled
- If Target Room will operate, then the MP-7 HE Zone shall be enabled

Note 1:

Radiation Zone Setup and Operation The radiation zones of the accelerator are separated into the Low Energy and High Energy Ends of both MP-6 and MP-7. Each end includes the zones on both the main floor and in the pit or basement. The upstairs and corresponding downstairs zones of each end are protected by a common radiation monitor. When a zone has been properly swept and the appropriate pushbuttons pressed during the inspection tour, a blinking red light at each pushbutton station will stop blinking. A purple light will also be illuminated on the main Radiation Display Panel. Rotating beacon-type lights are used to alert personnel in the zone and indicate that the radiation level in that zone is either at the yellow or red level. The zone should then be totally excluded and may only be entered with caution if the yellow light is on. If the red light is on, the area is an exclusion area and entering that area will shut down the accelerator.

Note 2:

General Operational Procedure The only time that all the zones of the two accelerator areas need to be set is when the machines are accelerating high intensity beams of protons or deuterons. Even under these conditions it is often possible to operate with insignificant radiation in the low energy end of MP-6. When both accelerators are operating in two-stage mode and accelerating high intensity beams of protons or deuterons, the entire area may be at moderate radiation levels and should be completely secured or "zoned". As the mass of accelerated particles gets heavier the radiation levels generally decrease. The operator should always be cautious in terms of radiation levels when first starting up within unknown beam. Quite often, when heavy ions are being accelerated, the ion that is actually accelerated is a molecule such as OH or NH₂. These molecules often break up in the process of acceleration, either due to residual gas in the ion source or in the acceleration tubes. These broken molecules can provide protons which may be accelerated out of the machine and can cause modest amounts of both gamma and fast neutron radiation. This process often causes a yellow condition and occasionally a red condition in the high energy end depending on the tuning conditions of the accelerators. This radiation is usually only associated with the high energy end or object slits and corresponding radiation levels in the low energy end are usually in the green condition. The best procedure for operating the machines so as to avoid unwarranted shutdowns due to unexpected radiation, is to set the radiation zones before removing the low energy cup. Then get the machines tuned up into their normal operating condition. In this way, the radiation levels can all be observed under normal operating conditions. If green, it is not necessary to continue with protected zones while if yellow or red, accelerator operation is not interrupted by a radiation violation due to open radiation zones.

Check

1.0 MP-7 High Energy Radiation Zones Sweep

- ____ 1.1 Enter the zone from the Control Room. Press the Radiation Station 18 pushbutton located near the large access door of the MP-7 pressure vessel. This switch sets light barrier LB11 across the midpoint of MP-7 so that it will be tripped by anyone moving through the zone after the inspection. When any station button is pressed the corresponding red light will begin to blink to indicate the activation of that station.
- ____ 1.2 Proceed toward the High Energy end of MP-7, crossing to the north side of the room underneath the beam line. Press the Radiation Station 19 pushbutton. The area between the north side of the accelerator and the north wall back to the light barrier LB10 should be inspected to see that it is free of personnel.
- ____ 1.3 Continue the inspection around the Analyzer magnet and the Switching magnet. See that Radiation Station 25 in the TtB tunnel is activated and that its red light is on and not blinking. This indicates that the TtB tunnel has been properly secured.
- ____ 1.4 Continue back to the original entry point. After walking by the activated light barrier LB11, press the Radiation Station 17 pushbutton. The zone will be set as indicated by a non-blinking Radiation Station light. The overhead lights will also be extinguished. The corresponding purple light on the Master Display Panel will light.
- ____ 1.5 Enter the downstairs zone of the High Energy end of MP-7 and press the Radiation Station 13 pushbutton.
- ____ 1.6 Inspect the area as you proceed to the far end and press the Radiation Station 14 pushbutton.
- ____ 1.7 On returning back to the original entry point, press the Radiation Station 12 pushbutton. This secures the zone and lights the purple light on the Master Display Panel.
- ____ 1.8 If the blinking red lights do not stop blinking and the overhead lights do not go out, the zone is not set.
- ____ 1.9 The upstairs and downstairs zones can be set with one walkthrough. Starting at the upstairs entrance to the zone at the midpoint of the accelerator, and leaving the downstairs zone at the midpoint of the accelerator, or in reverse if desired. When entering the zone, press the Radiation Station 18 pushbutton. Proceed through the tour pressing the Radiation Station 19 pushbutton as you go down the stairs. At the bottom of the stairs press the Radiation Station 14 pushbutton followed by the Radiation Station 13 pushbutton and on leaving the area press the Radiation Station 12 pushbutton. Both upper and lower purple lights will light on the Master Display Console indicating the successful sweep of both zones.

2.0 MP-7 Low Energy Radiation Zones

- ____ 2.1 When clearing the downstairs zone at the Low Energy end of MP-7, press the Radiation Station 11 pushbutton at the bottom of the stairs.
- ____ 2.2 Proceed through the pit zone, press the Radiation Station 12 pushbutton, and when leaving the zone, depress the Radiation Station 15 pushbutton at the top of the stairs.

- ____ 2.3 To set the upstairs zone, enter through the control room access and press the Radiation Station 15 pushbutton followed by the Radiation Station 16 pushbutton and the Radiation Station 17 pushbutton. Then close the shielding door to the control room and press the Radiation Station 29 pushbutton which will then interlock the Low Energy end of MP-7 and also turn out all room lights in the entire accelerator area.
- ____ 2.4 It is possible to clear the entire accelerator area and set all four zones in one continuous walkthrough.
- ____ 2.4.1 Starting from the Control Room door proceed to the High Energy end of MP-7, down the stairs and back to the basement at the Low Energy end of MP-7, and up the stairs and out of the control room.
- ____ 2.4.2 This can also be done in the reverse direction, pressing all station buttons in the course of the tour.

3.0 MP-6 High Energy Radiation Zones

- ____ 3.1 The zone at the High Energy end of MP-6 can be set by first entering the zone from the control room access door and pressing the Radiation Station 26 pushbutton after passing through the gate between the two accelerator rooms and securing that gate.
- ____ 3.2 Proceed around the end of the Switching magnet and down to the light beam barrier at the mid-section of MP-6. Press the Radiation Station 30 pushbutton.
- ____ 3.3 Proceed back toward the High Energy end of MP-6 and underneath the beam line to the north wall, inspecting the area behind MP-6. Press the Radiation Station 10 pushbutton.
- ____ 3.4 Leave the zone through the gate between the two accelerators and press the Radiation Station 27 pushbutton which sets the zone as indicated by the purple light in the corresponding zone of the Master Display Panel. This will also extinguish the MP-6 High Energy overhead lights.
- ____ 3.5 The downstairs zone is set by first pressing the Radiation Station 4 pushbutton at the base of the stairs.
- ____ 3.6 Press the Radiation Station 5 pushbutton near the wire passageway.
- ____ 3.7 Proceed through the pit zone to the barrier between the two machines, and press the Radiation Station 32 pushbutton at the light beam barrier at the mid-point of the accelerator.
- ____ 3.8 Leave the zone through the stairwell that was originally entered and press the Radiation Station 10 pushbutton at the top of the stairwell. This will activate the corresponding purple zone light on the Master Radiation Display Panel and turn out the high energy pit overhead lights.

4.0 MP-6 Low Energy Radiation Zones

- ____ 4.1 Enter the zone via the shielding door.
- ____ 4.2 Press the Radiation Station 31 pushbutton followed by the Radiation Station 6 pushbutton and the Radiation Station 7 pushbutton.
- ____ 4.3 When leaving the zoned area, close the shielding door and press the Radiation Station 28 pushbutton which then secures the upstairs zone and turns out the low energy overhead lights.
- ____ 4.4 The downstairs zone is secured by pressing the Radiation Station 1 pushbutton at the bottom of the

stairs followed by the Radiation Station 33 pushbutton at the mid-point of the machine in the pit.

____ 4.5 Leave the zone via the stairs and press the Radiation Station 6 pushbutton at the top of the stairs which then sets the zone and extinguishes the low energy pit overhead lights.

____ 4.6 The entire MP-6 accelerator can be set up or zoned in one walk through if the shielding door is closed before the tour starts from the Control Room.

____ 4.6.1 Start at the gate between the two machines and proceed via the stairs down to the basement at the High Energy end of the machine, through the pit areas, up the stairs, and back out the gate between the two machines setting all Radiation Station pushbuttons as you tour the area and inspect to see that no personnel have been overlooked. This can also be done in the reverse direction.

5.0 Target Room Radiation Zones

____ 5.1 Secure the room with the shielding door closed and check the radiation level with the beam on target as desired by an experimenter before allowing access to the room.

____ 5.2 There is only a single Radiation Station pushbutton for each of the target rooms. They can be easily cleared by casual inspection from the main entrance to the target room.

____ 5.3 This Radiation Station pushbutton is inside the room near the Shielding Door Control Panel.

____ 5.4 Inspect the room to see that all personnel have been cleared out. Personnel are not to be closed into target rooms either by mistake or deliberately.

____ 5.5 After inspecting the room, call out loud and clear that the room is to be cleared and all personnel.

____ 5.6 Press the Radiation Station pushbutton, leave the room, and close the shielding door. All the main room lights will go out. Emergency lights are always left on in the target room.

6.0 File Completed Checklists in Appropriate Checklist Binder